1/3

#27/Appeal Brief 4/13/1 BV

IN THE UNITED STATES PATENT & TRADEMARK OFFICE

In re Patent Application of

KINNSHAW et al.

Application No. 09/025,345 Group Art Unit: 3641

Filed: February 18, 1998 Examiner: Miller, E.

Title: METAL COMPLEXES FOR USE AS GAS GENERANTS

* * *

April 6, 2001

BRIEF ON APPEAL

Hon. Commissioner of Patents
And Trademarks
Washington, D.C. 20231
BOX APPEAL

Dear Sir:

In response to the final Office Action dated September 13, 2000 and the Advisory Actions of December 21, 2000 and March 19, 2001, Applicants submit herewith this Brief on Appeal in triplicate as required by 37 C.F.R. § 1.192. A Notice of Appeal was filed on January 16, 2001. Applicants respectfully submit that this appeal is proper, since the claims have been twice and finally rejected.

(1) REAL PARTY IN INTEREST

The real party in interest is Cordant Technologies Inc., the assignee of record of the above-identified application by Assignment recorded on October 26, 1998 at Reel 9543, Frame 0727. Applicants

further point out that Cordant Technologies was in the process of being acquired by Alcoa Inc., and is currently in the process of being acquired by Alliant Techsystems, Inc. from Alcoa.

(2) RELATED APPEALS AND INTERFERENCES

There are no related appeals and/or interferences which will directly affect or be directly affected by or have a bearing on the Board's decision in the pending appeal.

(3) STATUS OF THE CLAIMS

Claims 1, 40, 78, and 81-117 remain pending in this application. Claims 40, 78, 81, 82, and 92-113 have been withdrawn from consideration pursuant to a restriction requirement. Claims 1, 83-91, and 114-117 stand rejected, and are the subject of this appeal.

(4) STATUS OF AMENDMENTS FILED SUBSEQUENT TO FINAL REJECTION

A final Office Action issued on September 13, 2000. An Amendment under 37 C.F.R. § 1.116 was filed on December 12, 2000. In the Advisory Action of December 21, 2000, the Examiner refused entry of the December 12, 2000 Amendment. The Supervising Primary Examiner issued supplemental correspondence on January 12, 2001.

A second Amendment under 37 C.F.R. § 1.116, a terminal disclaimer, and papers for effecting change of counsel were filed on March 7, 2001. On March 13, 2001, a Notice accepting the change of

counsel was issued. In a subsequent Advisory Action of March 19, 2001, the Examiner indicated that the terminal disclaimer overcame the obviousness-type double patenting rejection. The Advisory Action also indicated that the second Rule 116 Amendment and terminal disclaimer would be entered upon the filing of an Appeal Brief.

(5) CONCISE EXPLANATION OF THE INVENTION

The invention relates to a solid gas generating composition formulated for generating gas suitable for use in deploying an air bag or balloon from a supplemental restraint system.

The gas generating composition of a supplemental restraint system must be capable of generating gas at a sufficient rate to inflate an air bag of the supplemental restraint system within a fraction of a second to prevent the driver from being thrusted into the steering wheel. (Page 1, line 25 to page 2, line 4.) Another requirement placed on gas generating compositions of supplemental restraint systems involves the restrictions placed on the generation of toxic or harmful gases, such as CO, CO_2, NO_x, SO_x, and hydrogen sulfide. (Page 2, lines 5-15.) The gas generating composition of a supplemental restraint system must also produce gases that are not overly hot, since excessive heat generated by the gas can burn the vehicle occupant upon impacting a just deployed air bag. (Page 2, lines 16-25.) Still another requirement of supplemental restraint

systems is that limited quantities of particulate materials be produced to protect against inhalation hazards, skin and eye irritation, and the like. (page 2, line 26 to page 3, line 8.) In this regard, it is desirable that the gas generating composition produce a filterable slag. (Page 3, lines 9-15.)

It will be appreciated, therefore, that there are a number of important criteria for selecting gas generating compositions for use in automobile supplemental restraint systems. (Page 5, lines 3-6.)

The gas generating composition of the present invention makes use of a complex comprising a metal cation and a neutral ligand. The metals incorporated within the complexes may be transition metals, alkaline earth metals, metalloids, or lanthanide metals that are capable of forming complexes, such as ammine or hydrazine complexes. Cobalt is a preferred metal, although other metals, such as magnesium, manganese, nickel, titanium, copper, chromium, zinc, tin, rhodium, iridium, ruthenium, palladium, and platinum may be used. (Page 6, line 26 to page 7, line 5.) The neutral ligand contains hydrogen and nitrogen, and is preferably ammonia (NH_3) and/or hydrazine (N_2H_4). (Page 6, lines 2-5; page 7, lines 10-14.) The presence of this neutral ligand contributes to the production, upon complex combustion, of a mixture of gases containing nitrogen gas and water vapor. (Page 6, lines 11-13.)

One or more oxidizing anions are provided to balance the charge of the complex. (Page 6, lines 6-7.) Examples of typical oxidizing anions that may form part of the metal cation coordination complex are nitrates, nitrites, chlorates, perchlorates, peroxides, and superoxides. (Page 6, lines 7-11.)

Representative complexes include metal nitrite ammines, metal nitrate ammines, metal perchlorate ammines, metal nitrite hydrazines, metal nitrate hydrazines, and metal perchlorate hydrazines. (Page 6, lines 19-22.)

It is also within the scope of the invention to include metal complexes that contain a common ligand in addition to the neutral ligand. Examples of common ligands include aquo (H_2O), hydroxo (OH), carbonato (CO_3), oxalato (C_2O_4), cyano (CN), isocyanato (NC), chloro (Cl), fluoro (F), and the like. (Page 7, line 24 to page 8, line 2.)

It is further within the scope of the invention to include counter ions other than oxidizing anions. Examples of common counter ions include hydroxide, chloride, fluoride, cyanide, carbonate, phosphate, oxalate, borate, ammonium, and the like. (Page 8, lines 2-9.)

Examples of other ingredients that may be added to the gas generant composition of this invention include the following:

(i) a fuel, such as boron, magnesium, aluminum, hydrides of boron or aluminum, carbon, silicon, titanium, and zirconium (page 14, lines 20-24);

(ii) a co-oxidizer, such as nitrates, nitrites, chlorates, perchlorates, peroxides, oxides, and hydroxides (page 14, lines 24-26; page 18, lines 9-12);

(iii) binders, such as lactose, boric acid, silicates, polypropylene carbonate, polyethylene glycol, naturally occurring gums, polyacrylic acids, nitrocellulose, polyacrylamide, and polyamides (page 17, lines 3-20);

(iv) a release agent, such as graphite, molybdenum sulfide, calcium stearate, and boron nitride (page 21, lines 5-8);

(v) carbon, such as carbon black or activated charcoal (page 17, lines 21-24);

(vi) burn rate modifiers, such as Fe_2O_3, $K_2B_{12}H_{12}$, and Bi_2MoO_6 (page 20, lines 21-22); and

(vii) slag forming agents, such as clays, talcs, silicon oxides, alkaline earth oxides, hydroxides, and oxalates (page 20, lines 22-26).

The gas generant ingredients are selected and formulated such that when the composition combusts, nitrogen gas and water vapor are produced. Depending upon the selection of binders, co-oxidizers,

ligands, and counter ions in the gas generating composition, the total carbon in the gas generant composition may be carefully controlled to prevent excessive generation of CO gas. Additionally, the combustion of the gas generant takes place at a rate sufficient to qualify such materials for use as gas generating compositions in automobile air bags and other similar types of devices. Importantly, the production of other undesirable gases or particulates may be substantially reduced or eliminated. (Page 10, lines 12-23.)

The metal complexes used in the present invention are unlike sodium nitrite and ammonium sulfate compositions, which have little utility as gas generating substances. Sodium nitrite and ammonium sulfate are observed to undergo metathesis reactions that result in unstable ammonium nitrite. In addition, most simple nitrite salts have limited stability. (Page 11, lines 17-25.)

In response to a restriction requirement, Applicants elected a species comprising a gas generating composition comprising a metal ammine complex, such as a metal nitrate ammine, and in particular cobalt nitrate ammine. The elected gas generating composition also comprises a release agent, of which calcium stearate is exemplary.

(6) CONCISE EXPLANATION OF THE ISSUES PRESENTED FOR REVIEW

(a) Whether claim 1 is anticipated under 35 U.S.C. § 102(b) over U.S. Patent No. 2,220,891 to Cook et al. (hereinafter "Cook"), U.S. Patent No. 3,138,498 to Rausch (hereinafter "Rausch"), and U.S. Patent No. 4,925,600 to Hommel et al. (hereinafter "Hommel").

(b) Whether claims 1, 83-91, and 114-117 are unpatentable under 35 U.S.C. § 103(a) over Cook and Hommel, in view of U.S. Patent No. 3,921,497 to Christmann et al. (hereinafter "Christmann").

(7) GROUPING OF THE CLAIMS

Claim 1 stands or falls alone.

Claim 83 stands or falls alone.

Claim 84 stands or falls alone.

Claims 85-91, 114, and 115 stand or fall together, but stand or fall separately from the remaining claims.

Claim 116 stands or falls alone.

Claim 117 stands or falls alone.

(8) ARGUMENTS

(a) Claim 1 Is Neither Anticipated By Cook, Hommel, or Rausch Nor Rendered Obvious by Cook and Hommel in Combination with Christmann

Claim 1 is reproduced below:

> 1. A solid gas generating composition *formulated for generating gas suitable for use in deploying an air bag or balloon from a supplemental restraint system*, said solid gas generating composition comprising:
>
> a complex of a metal cation and a neutral ligand containing hydrogen and nitrogen, such that when the complex combusts, *a mixture of gases suitable for use in deploying an air bag or balloon from the supplemental restraint system is produced*; and
>
> sufficient oxidizing anion to balance the charge of the metal cation.

(Emphasis added.)

Applicants respectfully submit that each of the cited patents fails to disclose or reasonably suggest a solid gas generating composition that, when combusted, produces "gas suitable for use in deploying an air bag or balloon from a supplemental restraint system," as recited in claim 1.

Cook is directed to a composition containing ammonium nitrate as "the preponderant ingredient, that is, in an amount greater than 50%," preferably greater than 75%. (Column 2, lines 14-18.) According to Cook, a "reaction product of the inorganic metal nitrate and ammonia should be present in an amount between 0.1 and 10.0%." (Column 2, lines 36-39.)

Hommel relates to a particulate ammonium nitrate for solid fuels or explosives. Similar to Cook, Hommel calls for low concentrations of metal complexes, specifically on the order of 1 to 5%. (Column 2, lines

42-47 and column 4, lines 28-33.) The metal complexes serve as additives in ammonium nitrate production.

The high concentrations of ammonium nitrate called for by Cook and Hommel, coupled with the low concentrations of metal complexes, are unsuitable for the type of environment encountered by a supplemental restraint system. Ammonium nitrate is prone to disassociation at high temperatures and is known to be hygroscopic. Additionally, compositions containing large amounts of ammonium nitrate have flame temperatures that lead to excessive NO_x and CO production, which is unacceptable for supplemental restraint systems. Finally, compositions containing large amounts of ammonium nitrate tend to have high pressure exponents and temperature sensitivity,k leading to large variability in performance and reduced safety margins.

The thermite composition of Rausch also is unsuited as a gas generant of a supplemental restraint system. The thermite would burn so intensely in a supplemental restraint system so as to melt the housing and other components of a supplemental restraint system. The Rausch compound is typical of conventional thermite compositions, which is why its intended use is described as being that of a fuel, not gas generant. The compositions of Rausch would, therefore, not be suitable for use in supplemental restraint systems.

Essentially, it seems that the main issue revolves around the degree of patentable weight to be afforded the emphasized (*i.e.*, italicized) language in claim 1 reproduced above. The Examiner has effectively afforded no weight to this claim language, and has failed to view the claims as a whole. This is reflected in the Office Action of September 13, 2000, wherein it is stated at page 2 that:

> It is hornbook law that the intended use of a composition, here, a known compound, will not define over the same compound for a different use. It is clear that a new intended use does not confer patentability on an otherwise old composition. See, for example, *In re Thuau*, 135 F.2d 344, 1943 C.D. 390, *In re Pearson*, 181 USPQ 641, and *In re Touminen*, 213 USPQ 89.

Applicants agree that where a claimed composition and a prior art composition are identical, the recitation of an intended use a composition of matter claim does not impart patentability on the claimed composition. However, this "hornbook law" is not applicable here.

Rather, claim 1 further characterizes its composition via physical attributes of the composition, and in particular the physical attributes of the composition upon combustion. The composition is formulated so that, when combusted, it generates a mixture of gases suitable for use in deploying an air bag or balloon from a supplemental restraint system. Stated differently, the composition is defined by a property, *i.e.*, suitability for a supplemental restraint system, that the composition

possesses upon combustion. This property may be realized by formulating or adaptation of the composition in the manner described in the specification.

This very issue has already been decided in case law. *Ex parte Conner*, 215 U.S.P.Q. 384 (Pat. & Tr. Off. Bd. of Appeals 1981) involved similar claim language, in which the claimed composition was stated to be "adapted for application to the human skin." The Board held that the claimed adaptation language was to be afforded patentable weight:

> The claims require that the claimed compositions be "adapted for application to the human skin" and are composed of "a cosmetic oil carrier * * *" in addition to benzalphthalide. The references relied upon by the Examiner do not disclose benzalphthalide in combination with a cosmetic oil carrier which compositions are suitable for application to the human skin. The various compositions of several of the references contain additional ingredients, e.g. sodium hydroxide or styrene, *which would have rendered the compositions unsuitable for application to the human skin.* The characterization in the claims that the compositions are "adapted for application to the human skin" *imposes a limitation in the claims which cannot be ignored in considering the patentability of the claims.*

Ex parte Wittpenn, 16 U.S.P.Q.2d 1730 (Bd. of Pat. Appeals & Inter. 1990) sets forth a similar holding. The Board held that the recitation in the preamble of a claim that a composition has "good foaming characteristics and such non-irritating characteristics that it is suitable for use on perioccular surface tissues" was entitled to patentable weight. *Wittpenn*, 16 U.S.P.Q.2d at 1730. The Board found the Examiner to be

in error, inasmuch as the "noted limitation in the instant claims cannot be ignored." *Id.* at 1731.

Indeed, the cases (such as *In re Pearson*) cited by the Examiner provide support for Applicants' position.

> *We do not mean to imply that terms which recite the intended use or a property of a composition can never by used to distinguish a new from an old composition.* However, assuming their compliance with the definiteness requirement of the second paragraph of 35 U.S.C. § 112, such terms must define, indirectly at least, some characteristic not found in the old composition. For example, if calcium compounds of very small particle size had not been known to the prior art, then a term defining the particle as being of a size which "when applied to the foliage of a peanut crop will substantially reduce the formation of pops and unsound kernels" might be capable of distinguishing the new composition from the old.

In re Pearson, 494 F.2d 1399, 1403, 181 U.S.P.Q. 641 (C.C.P.A. 1974) (emphasis added).

Applicants respectfully submit that a similar holding is warranted here. The claim terminology "suitable for" is tantamount to the language "adapted for" afforded patentable weight in *Ex parte Wittpenn.* Further, the Board of Patent Appeals and Interferences has already addressed the patentable weight to be afforded to the language "suitable for" in *Ex parte Wittpenn.*

The high concentrations of ammonium nitrate prescribed by the Hommel and Cook patents, and the high burn temperature of the

thermite composition of the Rausch patent, *"would have rendered the compositions unsuitable for application"* as a gas generant of supplemental restraint systems. For reasons similar to those set forth in the holding of *Ex parte Conner*, the Section 102(b) rejections are misplaced.

The Christmann patent, which was cited in support of the Section 103(a) rejection for its alleged disclosure that "nitrate explosives conventionally include water repelling agents of salts of fatty acids," does not overcome the deficiencies of Cook and Hommel discussed above.

Accordingly, reversal of the Section 102(b) and Section 103(a) rejections is respectfully requested.

(b) Cook, Hommel, and Christmann, When Taken Alone or in Combination, Fail to Disclose or Reasonably Suggest the Inventions of Dependent Claims 83-91 and 114-117

Each of claims 83-91 and 114-117 depends directly or indirect from claim 1 and, therefore, incorporates all of the distinguishing features of claim 1. Because claim 1 is patentable over the cited art, it therefore follows that claims 83-91 and 114-117, which depend from claim 1, must also be patentable for the reasons expressed above. For this reason alone, the Section 103(a) rejection of claims 83-91 and 114-117 should be withdrawn.

Additional reasons for mandating the withdrawal of the Section 103(a) rejection against claims 83-91 and 114-117 are set forth below.

(i) Claim 83

Claim 83 recites that the gas generating composition comprises at least one member selected from the group consisting of a binder, a release agent, and a small but effective amount of carbon powder.

Cook does not disclose or suggest the use of a binder, release agent, or carbon powder. Hommel is similarly deficient.

In addition, Cook and Hommel disclose compositions that would not have been suitable gas generants for supplemental restraint systems for the reasons discussed above. Combining Cook or Hommel with Christmann would not have fundamentally changed the Cook and Hommel compositions so as to make them suitable gas generants for supplemental restraint systems. Further, Christmann is directed to the filling of aquiferous boreholes with explosives. As such, Christmann is not related to supplemental restraint systems, and would not have provided the requisite teachings to motivate a person of ordinary skill in the art to modify Cook and Hommel in such a manner as to make their compositions suitable for supplemental restraint systems.

For these reasons, the Section 103(a) rejection of claim 83 should be withdrawn.

(ii) Claim 84

Claim 84 depends from claim 1, and calls for the gas generating composition to comprise calcium stearate.

Neither Cook nor Hommel disclose the use of calcium stearate.

Christmann mentions water repelling agents of salts of fatty acids, as well as lubricants such as graphite or molybdenum disulfide. However, Christmann is silent with regard to the use of calcium stearate.

In the Office Action of September 13, 2000, the Examiner stated that the use "of calcium stearate for the water repelling agent, or the lubricants as taught, in the primary references would have been obvious." The Examiner does not explain, and it is not at all apparent to Applicants, how this conclusion of obviousness is derived. The cited patents are completely silent as to the use of calcium stearate.

For these reasons, reversal of the rejection of claim 84 is respectfully requested.

(iii) Claims 85-91, 114, and 115

Claim 85 recites that the gas generating composition comprises a release agent.

Cook does not disclose or suggest the use of a release agent. Hommel is similarly deficient.

In addition, Cook and Hommel disclose compositions that would not have been suitable gas generants for supplemental restraint systems for the reasons discussed above. Combining Cook or Hommel with Christmann would not have fundamentally changed the Cook and Hommel compositions so as to make them suitable gas generants for supplemental restraint systems. Further, Christmann is directed to the filling of aquiferous boreholes with explosives. As such, Christmann is not related to supplemental restraint systems, and would not have provided the requisite teachings to motivate a person of ordinary skill in the art to modify Cook and Hommel in such a manner as to make their compositions suitable for supplemental restraint systems.

For these reasons, reversal of the rejection of claims 85-91, 114, and 115 is respectfully requested.

(iv) Claim 116

Claim 116 recites that the composition contains from 48.5% to less than 100% of the complex, and a release agent.

Cook and Hommel, when taken together or in combination with Christmann, fail to establish a *prima facie* case of obviousness with respect to the release agent, as discussed above in Section (8)(b)(iii). For this reason alone, the Section 103(a) rejection of claim 116 should be withdrawn.

Additionally, Cook states that a "reaction product of the inorganic metal nitrate and ammonia should be present in an amount between 0.1 and 10.0%." (Column 2, lines 36-39.) Hommel states that its composition has a low concentration of metal complexes, specifically on the order of 1 to 5%. (Column 2, lines 42-47 and column 4, lines 28-33.) Neither of these patents teaches or reasonably suggests the claimed range of 48.5 to less than 100% of the complex.

For these reasons, reversal of the rejection of claim 116 is requested.

(v) Claim 117

Claim 117 states, *inter alia*, that the composition is formulated to combust "at a rate and temperature sufficient to qualify said composition for use as a gas generating composition to generate gas suitable for use in deploying said air bag or said balloon."

In Cook, the "preponderant ingredient" is ammonium nitrate. Cook states that its ammine complex is present in an amount "between 0.1 and 10.0%." Hommel likewise focuses on the production of ammonium nitrate, with a "metalamine complex" present as an additive at a low concentration of 1 to 5%.

These compositions would not combust at a rate and temperature sufficient to qualify the compositions for use as gas generants of

supplemental restraint systems. The high concentrations of ammonium nitrate called for by Cook and Hommel, considered in combination with the low concentrations of metal complex, are unsuitable for the type of environment encountered by a supplemental restraint system. Ammonium nitrate is prone to disassociation at high temperatures and is known to be hygroscopic. Additionally, compositions containing large amounts of ammonium nitrate have flame temperatures that lead to excessive NO_x and CO production, which is unacceptable for supplemental restraint systems. Finally, compositions containing large amounts of ammonium nitrate tend to have high pressure exponents and temperature sensitivity leading to large variability in performance and reduced safety margins.

Christmann does not overcome the deficiencies of Cook and Hommel.

For these reasons, reversal of the rejection of claim 117 is respectfully requested.

(9) CONCLUSION

For all the above-discussed reasons, it is clear that the inventions recited in Applicants' claims are patentable over the art of record. Accordingly, reversal of all remaining rejections and allowance of claims 1, 83-91, and 114-117 are respectfully requested.

Respectfully submitted,

Sullivan Law Group

By _____

Stephen T. Sullivan
Registration No. 32,444
Telephone No. (602) 956-6161
-- and --
David S. Taylor
Registration No. 39,045
Telephone No. (202) 661-6114
Fax: (602) 956-6262

STS/DST
Sullivan Law Group
5060 North 40th Street
Suite 120
Phoenix, Arizona 85018

(10) APPENDIX: PENDING CLAIMS

1. A solid gas generating composition formulated for generating gas suitable for use in deploying an air bag or balloon from a supplemental restraint system, said solid gas generating composition comprising:

a complex of a metal cation and a neutral ligand containing hydrogen and nitrogen, such that when the complex combusts, a mixture of gases suitable for use in deploying an air bag or balloon from the supplemental restraint system is produced; and

sufficient oxidizing anion to balance the charge of the metal cation.

40. A method of inflating an air bag comprising combusting a gas generating composition containing a complex of a transition metal cation or alkaline earth metal cation and a neutral ligand containing hydrogen and nitrogen and sufficient oxidizing anion to balance the charge of the metal cation, such that when the gas generating composition combusts, a mixture of gasses containing nitrogen gas and water vapor is produced.

78. A gas generating device comprising:

a gas generating composition comprising:

a complex of a metal cation or alkaline earth metal cation and a neutral ligand containing hydrogen and nitrogen, such that when the complex combusts, a mixture of gases containing nitrogen gas and water vapor is produced;

sufficient oxidizing anion to balance the charge of the metal cation; and

means for initiating the combustion of the composition.

81. An automobile air bag system comprising:

a collapsed, inflatable air bag;

a gas generating device connected to the air bag for inflating the air bag, the gas-generating device containing a gas-generating composition comprising:

a complex of a metal cation or alkaline earth metal cation and a neutral ligand containing hydrogen and nitrogen, such that when the complex combusts, a mixture of gases containing nitrogen gas and water vapor is produced;

sufficient oxidizing anion to balance the charge of the metal cation; and

means for initiating the combustion of the composition.

82. A vehicle containing a supplemental restraint system having an air bag system comprising:

a collapsed, inflatable air bag;

a gas generating device connected to the air bag for inflating the air bag, the gas-generating device containing a gas-generating composition comprising:

a complex of a metal cation or alkaline earth metal cation and a neutral ligand containing hydrogen and nitrogen, such that when the complex combusts, a mixture of gases containing nitrogen gas and water vapor is produced;

sufficient oxidizing anion to balance the charge of the metal cation; and

means for initiating the combustion of the composition.

83. A gas generating composition according to claim 1, wherein said gas generating composition is formulated from ingredients which comprise

at least one complex of a metal cation and at least one neutral ligand which comprises ammonia, wherein said metal cation is a transition metal cation or an alkaline earth metal cation, and sufficient anion to balance the charge of the metal cation;

at least one of:

binder,

release agent, or

a small but effective amount of carbon powder whereby the crush strength of the composition is increased compared to the composition without the carbon powder; and

optionally co-oxidizer in an amount less than 50% by weight of said composition.

84. A gas generating composition according to claim 1, wherein said gas generating composition is formulated from ingredients which comprise

at least one complex of a metal cation and at least one neutral ligand which comprises ammonia, wherein said metal cation is a transition metal cation or an alkaline earth metal cation, and sufficient anion to balance the charge of the metal cation;

and calcium stearate; and

optionally co-oxidizer in an amount less than 50% by weight of said composition.

85. A gas generating composition according to claim 1, wherein said composition is formulated to include a release agent.

86. A gas generating composition according to claim 85, wherein the complex is selected from the group consisting of metal nitrite ammines, metal nitrate ammines, metal perchlorate ammines, and mixtures thereof.

87. A gas generating composition as defined in claim 85, wherein the metal cation is a transition metal, alkaline earth metal, metalloid, or lanthanide metal cation.

88. A gas generating composition as defined in claim 87, wherein the transition metal cation is a cobalt cation.

89. A gas generating composition as defined in claim 87, wherein the metal cation is a cation of a metal selected from the group consisting of cobalt, magnesium, manganese, nickel, titanium, copper, chromium, zinc, tin, rhodium, iridium, ruthenium, palladium and platinum.

90. A gas generating composition as defined in claim 85, wherein the oxidizing anion is selected from the group consisting of nitrate, nitrite, chlorate, perchlorate, peroxide and superoxide.

91. A gas generating composition as defined in claim 85, wherein the oxidizing anion is free of carbon.

92. A gas generating composition as defined in claim 85, further comprising a binder.

93. A gas generating composition as defined in claim 92, wherein the binder is water soluble.

94. A gas generating composition as defined in claim 93, wherein the binder is selected from naturally occurring gums, polyacrylic acids, and polyacrylamides.

95. A gas generating composition as defined in claim 92, wherein the binder is not water soluble.

96. A gas generating composition as defined in claim 92, wherein the binder is selected from nitrocellulose, VAAR (vinyl acetate vinyl alcohol resin), and nylon.

97. A gas generating composition as defined in claim 85, wherein the complex is hexamminecobalt (III) nitrate ($[(NH_3)_6Co](NO_3)_3$) and the composition further includes copper (II) trihydroxy nitrate ($Cu_2(OH)_3NO_3$).

98. A gas generating composition as defined in claim 85, wherein the complex includes at least one common ligand, in addition to the ammonia ligand.

99. A gas generating composition as defined in claim 98, wherein the common ligand is selected from the group consisting of aquo (H_2O), hydroxo (OH), perhydroxo (O_2H), peroxo (O_2), carbonato (CO_3), carbonyl (CO), oxalato (C_2O_4), nitrosyl (NO), cyano (CN), isocyanato (NC), isothiocyanato (NCS), thiocyanato (SCN), amido (NH_2), imido (NH), sulfato (SO_4), chloro (Cl), fluoro (F), phosphato (PO_4), and ethylenediaminetetraacetic acid (EDTA) ligands.

100. A gas generating composition as defined in claim 85, wherein the complex includes a common counter ion in addition to the oxidizing anion.

101. A gas generating composition as defined in claim 100, wherein the common counter ion is selected from the group consisting of hydroxide (OH^-), chloride (Cl^-), fluoride (F^-), cyanide (CN^-), thiocyanate (SCN^-), carbonate (CO^{-2}), sulfate (SO_4^{-2}), phosphate (PO_4^{-3}), oxalate ($C_2O_4^{-2}$), borate (BO_4^{-5}), and ammonium (NH_4^+) counter ions.

102. A gas generating composition as defined in claim 85, wherein said composition is formulated from ingredients comprising:

at least one complex of

a metal cation

at least one ammonia ligand, and

sufficient oxidizing anion to balance the charge of the metal complex wherein said composition contains about 50% to about 80% by weight of said complex and said anion; and

said releasing agent.

103. A gas generating composition as defined in claim 85, further comprising a co-oxidizer.

104. A gas generating composition as defined in claim 103, wherein the co-oxidizer is selected from the group consisting of alkali, alkaline earth, lanthanide or ammonium perchlorates, chlorates, peroxides, nitrites, and nitrates.

105. A gas generating composition as defined in claim 103, wherein the co-oxidizer is selected from the group consisting of metal oxides, metal hydroxides, metal peroxides, metal oxide hydrates, metal oxide hydroxides, metal hydrous oxides, basic metal carbonates, basic metal nitrates, and mixtures thereof.

106. A gas generating composition as defined in claim 103, wherein the co-oxidizer is selected from the group consisting of oxides of copper, cobalt, manganese, tungsten bismuth, molybdenum, and iron.

107. A gas generating composition as defined in claim 103, wherein the co-oxidizer is a metal oxide selected from the group

consisting of CuO, Co_2O_3, Co_3O_4, $CoFe_2O_4$, Fe_2O_3, MoO_3, Bi_2MoO_6, and Bi_2O_3.

108. A gas generating composition as defined in claim 103, wherein the co-oxidizer is a metal hydroxide selected from the group consisting of $Fe(OH)_3$, $Co(OH)_3$, $Co(OH)_2$, $Ni(OH)_2$, $Cu(OH)_2$, and $Zn(OH)_2$.

109. A gas generating composition as defined in claim 103, wherein the co-oxidizer is a metal oxide hydrate or metal hydrous oxide selected from the group consisting of $Fe_2O_3 \cdot xH_2O$, $SnO_2 \cdot xH_2O$, and MoO_3H_2O.

110. A gas generating composition as defined in claim 103, wherein the co-oxidizer is a metal oxide hydroxide selected from the group consisting of $CoO(OH)_2$, $FeO(OH)_2$, $FeO(OH)_2$, $MnO(OH)_2$, and $MnO(OH)_3$.

111. A gas generating composition as defined in claim 103, wherein the co-oxidizer is a basic metal carbonate selected from the group consisting of $CuCO_3$, $Cu(OH)_2$ (malachite), $2Co(CO_3) \cdot 3Co(OH)_2 \cdot H_2O$, $Co_{0.69}Fe_{0.34}(CO_3)_{0.2}(OH)_2$, $Na_3[Co(CO_3)_3]3H_2O$, $Zn_2(CO_3)(OH)_2$,

$Bi_2Mg(CO_3)_2(OH)_4$, $Fe(CO_3)_{0.12}(OH)_{2.76}$, $Cu_{1.54}Zn_{0.46}(CO_3)(OH)_2$, $CO_{0.49}Cu_{0.51}(CO_3)_{0.43}(OH)_{1.1}$, $Ti_3Bi_4(CO_3)_2(OH)_2O_9(H_2O)_2$, and $(BiO)_2CO_3$.

112. A gas generating composition as defined in claim 103, wherein the co-oxidizer is a basic metal nitrate selected from the group consisting of $Cu_2(OH)_3NO_3$, $Co_2(OH)_3NO_3$, $CuCo(OH)_3NO_3$, $Zn_2(OH)_3NO_3$, $Mn(OH)_2NO_3$, $Fe_4(OH)_{11}NO_3 \cdot 2H_2O$, $Mo(NO_3)_2O_2$, $BiONO_3 \cdot H_2O$, and $Ce(OH)(NO_3)_3 \cdot 3H_2O$.

113. A gas generating composition as defined in claim 85, further comprising a carbon powder present from 0.1% to 6% by weight of the gas generating composition.

114. A gas generating composition as defined in claim 86, wherein the complex is selected from the group consisting of metal nitrate ammines.

115. A gas generating composition as defined in claim 114, wherein the release agent comprises graphite, molybdenum sulfide, calcium stearate or boron nitride.

116. A gas generating composition according to claim 1, wherein said composition contains from 48.5% to less than 100% of said complex, and said composition contains a release agent.

117. A solid gas generating composition according to claim 85, wherein when said composition combusts, the combustion takes place at a rate and a temperature sufficient to qualify said composition for use as a gas generating composition to generate gas suitable for use in deploying said air bag or said balloon.